

| INCH-POUND |

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SUPERSEDING
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MILITARY SPECIFICATION

DELAY LINES, ACTIVE

GENERAL SPECIFICATION FOR

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the general requirements for fixed (tapped and untapped) pulse delay lines.

1.2 Classification.

1.2.1 Military Part or Identifying Number (PIN). The term Part or Identifying Number (PIN) is equivalent to the term (part number, identification number, and type designator) which was previously used in this specification. The PIN shall consist of the letter "M", the general specification number, the detail specification sheet number, a letter representing case style, an assigned dash number, a letter representing product assurance level, and a letter representing lead finish.

	M	83532/01	A	001	B	C
Military designator _____						
Specification sheet number _____						
Case style A, B, C, D, E, or F (see appendix) _____						
Dash number _____						
Product assurance level A, B, or S (see 3.3, 3.3.1, 3.3.2, 3.3.3) _____						
Lead finish (see 3.4.6.1) _____						

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in that issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Electronic Support Division AFLC, 2750 LOG/ES, Gentile Air Force Station, Dayton, OH 45444-5400 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 5999

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

SPECIFICATIONS

FEDERAL

- J-W-1177 - Wire, Magnet, Electrical.
- QQ-S-571 - Solder, Tin Alloy, Tin-Lead Alloy and Lead Alloy.

MILITARY

- MIL-C-123 - Capacitor, Fixed, Ceramic Dielectric, High Reliability, General Specification for.
- MIL-F-14256 - Flux, Soldering, Liquid (Rosin Base).
- MIL-S-19500 - Semiconductor Device, General Specification for.
- MIL-M-38510 - Microcircuits, General Specification for.
- MIL-H-38534 - Hybrid Microcircuits, General Specification for.
- MIL-R-55342 - Resistor, Fixed, Film, Chip, General Specification for.
- MIL-M-55565 - Microcircuit, Packaging of.
- MIL-C-55681 - Capacitor, Chip, Multiple Layer, Fixed Unencapsulated, Ceramic Dielectric.

(See supplement 1 for list of associated specifications.)

STANDARDS

MILITARY

- DOD-STD-100 - Engineering Drawing Practices.
- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts.
- MIL-STD-790 - Reliability Assurance Program for Electronic Parts Specifications.
- MIL-STD-810 - Environmental Test Methods.
- MIL-STD-883 - Test Methods and Procedures for Microelectronics.
- MIL-STD-1276 - Leads for Electronic Component Parts.
- MIL-STD-1285 - Marking of Electrical and Electronic Parts.
- MIL-STD-1686 - Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts.
- MIL-STD-1772 - Certification Requirements for Hybrid Microcircuits Facilities and Lines.
- MIL-STD-45662 - Calibration Systems Requirements.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

ELECTRONIC INDUSTRIES ASSOCIATION

- EIA Standard RS-242 - Definitions for Electromagnetic Delay Lines.

(Application for copies should be addressed to the Electronic Industries Association Engineering Office, 11 West 42nd Street, New York, NY 10036.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated detail specifications, specification sheets, or MS standards), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

3.2 Qualification. Delay lines furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable qualified products list at the time of award of contract (see 4.4 and 6.3). In addition, the manufacturer shall obtain certification from the qualifying activity that the reliability assurance requirements of 3.3 have been met and are being maintained.

3.3 Product assurance requirements. Three levels of delay line quality and reliability assurance are provided for in this specification. Levels A, B, and S delay lines shall be those which have been subjected to, and passed, all applicable requirements, tests, and inspections described herein, including qualification and quality conformance inspection requirements for the specified level.

3.3.1 Reliability assurance (level A). A reliability assurance program for delay lines furnished under this specification shall be established and maintained in accordance with the procedures and requirements specified in MIL-STD-790. Exceptions are as follows:

- a. Corrective action only for failures exceeding the allowable number.
- b. The manufacturer is required to document training.
- c. The manufacturer shall identify the critical operations and critical control points in the production process. Suitable control records shall be maintained and corrective actions taken when these indicate that the process is not in control.
- d. Manufacturer's internal audit is not required.
- e. Audits of sub-assembly manufacturers are not required.

3.3.2 Product assurance (level B). A product assurance program for level B delay lines furnished under this specification shall be established and maintained and shall meet the following requirements:

- a. A hermetically sealed case certified to MIL-STD-1772.
- b. Qualification to MIL-STD-1772.
- c. Screen to level B, method 5008 of MIL-STD-883.
- d. A quality assurance program in accordance with appendix A of MIL-H-38534.

3.3.3 Product assurance (level S). A product assurance program for level S delay lines furnished under this specification shall be established and maintained and shall meet the following requirements:

- a. Certification to MIL-STD-1772.
- b. Qualification to MIL-STD-1772.
- c. Class S requirements of method 5008 of MIL-STD-883.
- d. A quality assurance program in accordance with appendix A of MIL-H-38534.

3.3.4 Electronic sensitive device (ESD) control program. An ESD control program shall be established and maintained in accordance with MIL-STD-1686.

3.4 Materials. The materials shall be as specified herein; however, when a definite material is not specified, a material shall be used which will enable the delay line to meet the performance requirements of this specification. Acceptance or approval of any constituent material shall not be construed as a guaranty of the acceptance of the finished product (see 4.6.1).

3.4.1 Flammable materials. Materials used in the construction of delay lines shall be nonflammable and nonexplosive.

3.4.2 Corrosive materials. Corrosive materials used in any of the manufacturing processes shall be removed or neutralized so that no corrosion will result from such use. Materials used in the construction of delay lines shall be noncorrosive.

3.4.3 Solder and soldering flux. Solder, when used, shall be in accordance with QQ-S-571. Soldering flux shall be in accordance with MIL-F-14256.

3.4.4 Integrated circuits, (IC's). For level A, all IC's shall be qualified to MIL-M-38510, class B minimum.

3.4.5 Case material. Unless otherwise specified (see 3.1), cases may be of metallic or nonmetallic material. All metallic surfaces shall be protected against corrosion by a suitable finish and shall be free from blisters and other defects which may affect the protective value of this finish. For level B, the cases shall be hermetically sealed.

3.4.6 Terminals. Terminals shall be solder lug terminals, printed-circuit and dual-in-line terminals, or solid-wire lead terminals, as specified (see 3.1). All solder type terminals shall be capable of complying with the solderability requirements of this specification.

3.4.6.1 Lead finish. Lead frame or terminal material shall be in accordance with MIL-H-38534. The lead finish shall be designated by a single letter as follows:

<u>Finish letter</u>	<u>Lead frame or terminal material and finish</u>
A	Type A, B, or C, with hot solder dip
B	Type A, B, or C, with tin plate
C	Type A, B, or C, with gold plate

3.4.7 Magnet wire. Magnet wire shall be in accordance with J-W-1177.

3.4.8 Discreet semiconductor devices. Discreet semiconductor devices, including diodes, zener diodes, and transistor devices, shall be selected from MIL-S-19500, JANTX devices as a minimum. Nonstandard discreet semiconductor devices may be used provided that they are tested to and meet the screening requirements of MIL-S-19500 for level JANTX.

3.4.9 Passive circuit elements. Capacitors shall be qualified or screened to MIL-C-123 or MIL-C-55681. Resistors shall be qualified or screened to MIL-R-55342. The inductor shall be so designed as to allow the delay line to meet the requirements specified herein.

3.5 Design and construction. Delay lines shall be of the design, construction, and physical dimensions as specified in the applicable specification sheet (see 3.1).

3.5.1 Dimensions. When delay lines are inspected in accordance with 4.6.2, the dimensions shall be within the tolerances specified on the specification sheet (see 3.1).

3.5.2 Visual inspection. When delay lines are inspected in accordance with 4.6.3, the delay lines shall not exhibit flaking, pitting, blistering, peeling, cracks, bursting, bulging, or other defects. The delay lines shall also meet the requirements of 3.1, 3.20, and 3.21.

3.6 Solderability. When delay lines are tested as specified in 4.6.4, they shall meet the applicable criteria for terminal evaluation in the test method.

3.7 Resistance to solvents. When delay lines are tested as specified in 4.6.5, there shall be no evidence of mechanical damage and the markings shall remain legible. The paint or exterior finish shall not soften, peel, or show other signs of deterioration.

3.8 Resistance to soldering heat. When delay lines are tested as specified in 4.6.6, there shall be no softening of the insulation or loosening of the windings or terminals, no evidence of internal solder reflow or heat damage, and delay times shall meet initial requirements.

3.9 Terminal strength. When delay lines are tested as specified in 4.6.7 inclusive, there shall be no evidence of loosening, rupturing, or other mechanical damage. Bends shall not be considered as damage, unless surface cracking is evident.

3.10 Seal. When delay lines are tested as specified in 4.6.8 there shall be no evidence of continuous air bubble flow or compound leakage.

3.11 Electrical characteristics. Delay lines shall be capable of meeting all the electrical requirements (3.11.1 through 3.11.3) specified (see 3.1).

3.11.1 Delay time. Unless otherwise specified, when tested in accordance with 4.6.9.1.1, the overall specified delay times of the lines shall be as specified (see 3.1).

3.11.2 Rise time. When measured in accordance with 4.6.9.1.2, the rise time of pulses taken at the delay output shall be as specified (see 3.1).

3.11.3 Delay time at temperature extremes. When tested in accordance with 4.6.9.1.3, the delay time at the maximum and minimum operating temperatures shall be as specified (see 3.1).

3.11.4 DC characteristics. When tested in accordance with 4.6.9.1.4, the dc characteristics shall be as specified (see 3.1).

3.12 Salt spray (corrosion) (when specified, see 3.1). When delay lines are tested as specified in 4.6.10, there shall be no evidence of corrosion as exhibited by any visible degradation of the surfaces that can be attributed to flaking, pitting, blistering, or otherwise loosened protective coating or metal surface.

3.13 Vibration. When delay lines are tested as specified in 4.6.11, there shall be no leakage of filling material, no evidence of other physical damage such as cracks, bursting, or bulging of the case. There shall be no evidence of mechanical damage and there shall be no electrical discontinuity during the test.

3.14 Shock. When delay lines are tested as specified in 4.6.12, there shall be no leakage of filling material; no evidence of other physical damage such as cracks, bursting, or bulging of the case. There shall be no evidence of mechanical damage and there shall be no electrical discontinuity during the test.

3.15 Flammability (level A only). When delay lines are tested as specified in 4.6.13, there shall be no evidence of violent burning which results in an explosive-type fire, and the coating material used shall be self-extinguishing. A delay line shall not be considered to have failed in the event that it is consumed by the applied flame. A delay line shall be considered to have failed only if an explosion or dripping of flaming material occurs, an explosive-type flame is produced, or if visible burning continues beyond the allowable duration of 3 minutes after removal of the applied flame.

3.16 Thermal shock. When delay lines are tested as specified in 4.6.14, not more than 10 percent of the surface shall have peeling, flaking, chipping, cracking, or other impairment of the protective finish; no evidence of other physical damage such as cracks, bursting, or bulging of the case; or other defects that would affect the mechanical or electrical operation, and the delay time shall meet initial requirements of the detail specification.

3.17 Moisture resistance. When tested in accordance with 4.6.15, there shall be no evidence of other physical damage that would affect the mechanical or electrical operation of the delay line. The delay time shall meet initial requirements of the detail specification.

3.18 Life. When delay lines are tested as specified in 4.6.16, there shall be no evidence of impairment to the protective finish or of other physical damage such as cracks, bursting, or bulging of the case. The delay time shall meet initial requirements of the detail specification.

3.19 Fungus (level A only). The manufacturer shall certify that all external materials are nonnutrient to fungus growth or are suitably treated to retard fungus growth, or shall perform the test specified in 4.6.17. When delay lines are tested as specified in 4.6.17, there shall be no evidence of fungus growth on the external surface.

3.20 Marking.

3.20.1 JAN and J marking. The United States Government has adopted, and is exercising legitimate control over the certification marks "JAN" and "J", respectively, to indicate that items so marked or identified are manufactured to, and meet all the requirements of military specifications. Accordingly, items acquired to, and meeting all the criteria specified herein and in applicable detail specifications shall bear the certification mark "JAN" except that items too small to bear the certification mark "JAN" shall bear the letter "J". The "JAN" or "J" shall be placed immediately before the PIN except that if such location would place a hardship on the manufacturer in connection with such marking, the "JAN" or "J" may be located on the first line above or below the PIN. Items furnished under contracts or orders which either permit or require deviation from the conditions or requirements specified herein or in applicable detail specifications shall not bear "JAN" or "J". In the event an item fails to meet the requirements of this specification and the applicable specification sheets or detail specifications, the manufacturer shall remove the "JAN" or the "J" from the sample tested and also from all items represented by the sample. The "JAN" or "J" certification mark shall not be used on products acquired to contractor drawings or specifications. The United States Government has obtained Certificate of Registration No. 504,860 for the certification mark "JAN".

3.20.2 Full marking. Each delay line shall be marked on the top in accordance with method I of MIL-STD-1285 with the following information:

- a. JAN marking.
- b. PIN.
- c. Index mark identification (next to pin 1, input).
- d. Manufacturer's source code or logo.
- e. Date code.
- f. When applicable, SED/ESD mark for sensitive devices (may be used as index mark).

3.21 Workmanship. Delay lines shall be processed in such a manner as to be uniform in quality and shall be free from defects that will affect life and serviceability. Parts shall be free of flash pits, voids, and excessive mold marks. A visible parting line is acceptable.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.1.2 Test equipment and inspection facilities. Test and measuring equipment and inspection facilities of sufficient accuracy, quality and quantity to permit performance of the required inspection shall be established and maintained by the manufacturer. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with MIL-STD-45662.

4.1.3 Quality assurance program.

4.1.3.1 Level A. A quality assurance program shall be established and maintained in accordance with MIL-STD-790 (see 3.3.1).

4.1.3.2 Levels B and S. A quality assurance program shall be established and maintained in accordance with appendix A of MIL-H-38534.

4.2 Classification of inspections. The inspections specified herein are classified as follows:

- a. Qualification inspection (see 4.4).
- b. Quality conformance inspection (see 4.5).

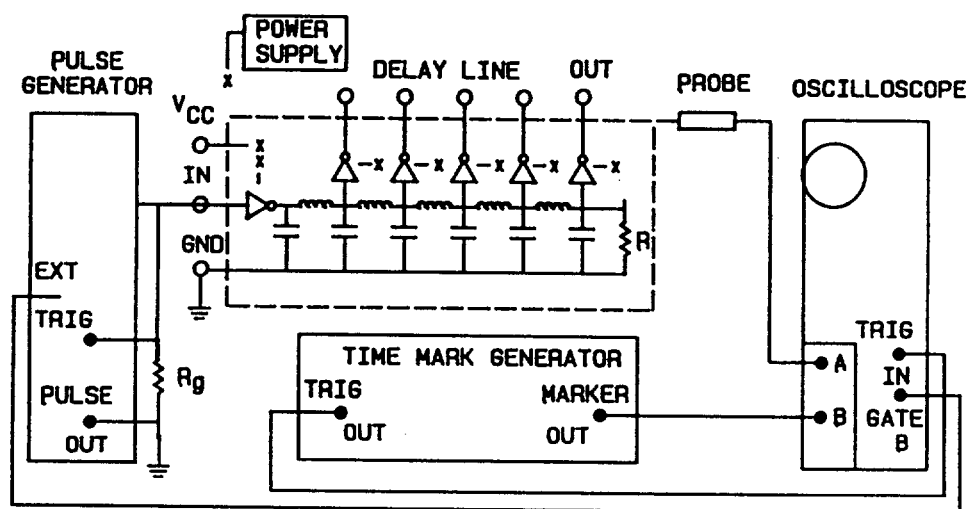
4.3 Inspection conditions. Unless otherwise specified herein, all inspections shall be performed in accordance with the test conditions specified in the "GENERAL REQUIREMENTS" of MIL-STD-202.

4.3.1 Reference test circuit, test equipment and measurements. Reference test circuit, test equipment, and measurements shall be as specified in 4.3.1.1 through 4.3.1.5.

4.3.1.1 Reference test circuit. The reference test circuit shall be as shown on figure 1. The delay line shall be terminated internally. The test circuit capacitances including probe shall be 10 pF maximum. Waveform characteristics are shown on figure 2. Any circuit possessing the same accuracy as the reference test circuit may be used. However, in case of conflict, the reference test circuit will take precedence.

4.3.1.2 Test equipment. The test equipment shall be as follows:

- a. Marker generator: Capable of 10 times the delay time tolerance.
- b. Pulse generator: Capable of 3 nanoseconds rise time.
- c. Oscilloscope: 350 megahertz bandwidth minimum, analog, dual channel.
- d. Probe: The oscilloscope's recommended probe should be used. The probe capacitance and circuit capacitance shall be 10 pF maximum at probe tip.
- e. Test fixture: A fixture with a massive ground plane shall be used. All leads shall be 0.25 inch (6.35 mm) maximum. Stray capacitance and inductance shall be less than 10 pF and 10 nH respectively. Resistors shall be noninductive types. Coaxial cable shall be used, RG-58 c/u or equivalent, 15 inches (381.00 mm) length maximum.



NOTES:

1. All measurements refer to definitions of EIA Standard RS-242.
2. R_g = generator terminating impedance.

FIGURE 1. Reference test circuit.

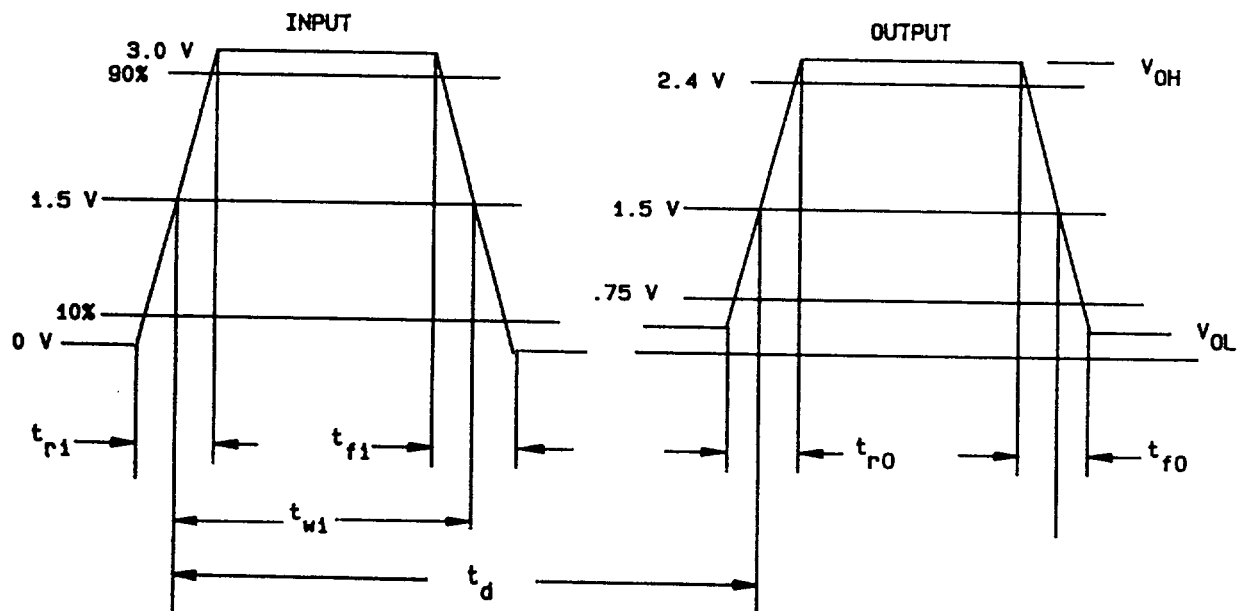


FIGURE 2. Waveform characteristics.

4.3.1.3 Delay measurements. The basic steps for measurement of delay shall be as follows:

- a. Establish reference $t_d = 0$.
- b. Sweep speed: Use sweep speed such that the output rise is displayed across 4 cm minimum so that it crosses the screen at approximately 45° . The markers may then be chosen so as to provide a mark each 1-2 cm.
- c. Display markers selected (see 4.3.1.3b) on channel B.
- d. Display input pulse on channel A. Set amplitude deflection for 3.0 volts.
- e. Adjust "pulse position vernier" on pulse generator for coincidence of +1.50-volt level, leading edge, of input pulse and reference marker.
- f. To measure delay of output pulse, move channel A probe to output test point.
- g. Adjust delay time on oscilloscope, counting markers, until the output pulse is displayed.
- h. Delay equals the number of markers plus increment between last marker and +1.50-volt level, leading edge.

4.3.1.4 Rise time measurements. Rise time measurements shall be made as follows:

- a. Set sweep speed such that the output rise is displayed across 4-5 cm so that it crosses the screen at approximately 45° . The markers may then be chosen so as to provide a mark approximately equal to one-tenth rise time being measured or 1 ns, whichever is greater.
- b. Display markers selected (see 4.3.1.4a) on channel B.
- c. Display input pulse (input test point) on channel A. Set amplitude for 3.0 volts.
- d. To measure output rise time, move channel A probe to all output test points.
- e. Adjust delay time on oscilloscope until the output pulse is displayed.
- f. Measure output pulse rise time (t_{ro}) from .75 V to 2.40 V points.

4.3.1.5 Input characteristics.

- a. Input rise time/fall time: ≤ 3 ns (test points 10 to 90 percent).
- b. Input pulse amplitude: 3.3 V ± 0.5 V.
- c. Input pulse width: Input pulse width shall be as specified (see 3.1).
- d. Supply voltage: 5.00 ± 0.01 V dc.

4.4 Qualification inspection. Qualification inspection shall be performed at a laboratory acceptable to the Government (see 6.3) on sample units produced with equipment and procedures normally used in production.

4.4.1 Sample. The number of sample units comprising a sample of delay lines to be submitted for qualification inspection shall be as specified in table I.

4.4.2 Test routine. Qualification samples shall be subjected to the tests of table I in the order shown. All sample units shall be subjected to the tests of group I. The sample delay lines shall then be divided into three groups (see table I). The test within each group shall be performed in the order shown.

4.4.3 Failures. Failures in excess of those allowed in table I shall be cause for refusal to grant qualification.

TABLE I. Qualification inspection.

Inspection	Requirement paragraph	Method para-graph	Number of sample units		Number of failures	
			Class		Class	
			A	B	A	B
Group I						
Dimensions	3.5.1	4.6.2	22	22	2	2
Thermal shock (50 cycles)	3.16	4.6.14				
Seal	3.10	4.6.8				
Electrical characteristics	3.11	4.6.9				
Visual inspection	3.5.2	4.6.3				
Group II						
Resistance to solvents	3.7	4.6.5	10	10	0	0
Solderability	3.6	4.6.4				
Moisture resistance	3.17	4.6.15				
Salt spray (metal case)	3.12	4.6.10				
Shock	3.14	4.6.12				
Vibration	3.13	4.6.11				
Electrical characteristics	3.11	4.6.9				
Visual inspection 1/	3.5.2	4.6.3				
Group III						
Life	3.18	4.6.16	6	6	0	0
Terminal strength	3.9	4.6.7				
Fungus 2/	3.19	4.6.17				
Electrical characteristics	3.11	4.6.9				
Visual inspection 1/	3.5.2	4.6.3				
Group IV						
Resistance to soldering heat	3.8	4.6.6	4	2	0	0
Flammability	3.15	4.6.13				

1/ The "JAN" or "J" marking and PIN are not required on qualification samples.

2/ Test need not be performed if the manufacturer provides certification that all external materials are nonnutrient to fungus growth or suitably treated to retard fungus growth.

4.4.4 Extent of qualification. Extent of qualification shall normally be applicable only for delay lines on the same specification sheet. However, where delay lines of a given minimum section requirement on one specification sheet are qualified, delay lines of a lesser minimum section requirement on another sheet shall, on the basis of greater design simplicity, be qualified, provided they are essentially equivalent in form, fit, and function to those on the first sheet. As a requisite of extension of qualification, the product involved must be manufactured using the same facilities, processes, and materials as the product originally submitted for qualification. Qualification of the lowest total delay time and highest total delay time for a given specification sheet will extend qualification for all intermediate total delay values. Lowest time delay shall have lowest impedance; highest time delay shall have highest impedance. Qualification shall not be extended from one product assurance level to another, nor from one case style to another.

4.4.5 Retention of qualification. To retain qualification, the contractor shall forward a report at least every 12 months to the qualifying activity. The qualifying activity shall establish the reporting date. The report shall consist of:

- a. A summary of the results of the tests performed for group A inspection indicating, as a minimum, the number of lots that have passed and the number that have failed. The results of tests of all reworked lots shall be identified and accounted for.
- b. A summary of the results of tests performed for group B inspection including the number and mode of failures. The summary shall include results of all group A inspection tests performed and completed during the reporting period. If the summary of the test results indicates nonconformance with specification requirements, and corrective action acceptable to the qualifying activity has not been taken, action may be taken to remove the failing product from the qualified products list. Failure to submit the report within 30 days after the end of each reporting period may result in loss of qualification for the product. In addition to the periodic submission of inspection data, the contractor shall immediately notify the qualifying activity if, at any time during the reporting period, the inspection data indicates failure of the qualified product to meet the requirements of this specification.

In the event that no production occurred during the 12-month reporting period, a report shall be submitted certifying that the company still has the capabilities and facilities necessary to produce the item. If during two consecutive reporting periods there has been no production, the manufacturer may be required, at the discretion of the qualifying activity, to submit the products (a representative product of each delay line) to testing in accordance with the qualification inspection requirements.

In addition to the above, the manufacturer shall requalify every 36 months. Actual groups A and B test data shall be submitted to the qualifying activity upon request.

4.5 Quality conformance inspection and in-process inspection.

4.5.1 Inspection of product for delivery. Inspection of product for delivery for level A shall consist of group A inspection. Inspection of product for delivery for level B shall be in accordance with method 5008 of MIL-STD-883, class B. Inspection of product for delivery for level S shall be in accordance with the quality conformance inspection of method 5008 of MIL-STD-883, class S.

4.5.1.1 Inspection lot.

4.5.1.1.1 Levels A and B delay lines. An inspection lot shall consist of all delay lines of a single PIN, produced under essentially the same conditions, and offered for inspection at one time.

4.5.1.2 Group A inspection. Group A inspection for level A shall consist of the inspections specified in table II in the order shown.

4.5.1.2.1 Sampling plan. Statistical sampling and inspection shall be in accordance with MIL-STD-105 for general inspection level II. The acceptable quality level (AQL) shall be as specified in table II. Major and minor defects shall be as defined in MIL-STD-105. One-hundred percent inspection shall be performed as specified in table II.

TABLE II. Group A inspection.

Inspection	Requirement paragraph	Test method paragraph	AQL (percent defective)	
			Major	Minor
<u>Subgroup I</u>				
Thermal shock (15 cycles)	3.16	4.6.14	100 percent	100 percent
Seal	3.10	4.6.8	100 percent	100 percent
Delay time	3.11.1	4.6.9.1.1	100 percent	100 percent
Rise time	3.11.2	4.6.9.1.2	100 percent	100 percent
DC characteristics	3.11.4	4.6.9.1.4	100 percent	100 percent
<u>Subgroup II</u>				
Delay time at temperature extremes	3.11.3	4.6.9.1.3	1.0	4.0
Dimensions	3.5.1	4.6.2	1.0	4.0
Visual inspection	3.5.2	4.6.3	1.0	4.0

4.5.1.2.2 Rejected lots:

- a. Subgroup I: Lots having more than 5 percent total rejects shall not be furnished on the contracts. Delay lines out of specification limits shall not be shipped with the lot.
- b. Subgroup II: If an inspection lot is rejected, the contractor may screen out defective units and resubmit for inspection. Resubmitted lots shall be inspected using tightened inspection. Such lots shall be separate from new lots and shall be clearly identified as reinspected lots.

4.5.1.2.3 Disposition of sample units. Sample units which have passed group A inspection shall be delivered on the contract or purchase order if the lot is accepted.

4.5.2 Periodic check test. Periodic check test shall consist of group B inspection. Except where the results of these tests have shown noncompliance with the applicable requirements (see 4.5.2.1.4), delivery of products which have passed group A inspection shall not be delayed pending the results of group B inspection.

4.5.2.1 Group B inspection. Group B inspection shall consist of the inspections specified in table III, in the order shown. Group B inspection shall be made on sample units selected from inspection lots which have passed the group A inspection.

TABLE III. Group B inspection.

Inspection	Requirement paragraph	Method paragraph
Life	3.18	4.6.16
Resistance to solvents	3.7	4.6.5
Solderability	3.6	4.6.4
Salt spray (when specified)	3.12	4.6.10
Shock	3.14	4.6.12
Terminal strength	3.9	4.6.7
Electrical characteristics	3.11	4.6.9

4.5.2.1.1 Sampling plan. Every 12 months, 4 sample units of any total delay value of each specification sheet produced during the month prior to the annual inspection, shall be subjected to the inspection. If, during a 12-month period, qualification testing has been successfully completed on delay lines covered by extent of qualification (see 4.4.4), inspection may be omitted for that 12-month period.

4.5.2.1.2 Failures. If one or more sample units fail to pass group B inspection, the sample shall be considered to have failed.

4.5.2.1.3 Disposition of sample units. Sample units which have been subjected to group B inspection shall not be delivered on the contract or purchase order.

4.5.2.1.4 Noncompliance. If a sample fails to pass group B inspection, the manufacturer shall notify the qualifying activity, custodian of suspect lots, and the cognizant inspection activity of such failure and take corrective action on the materials or processes, or both, as warranted, and on all units of product which can be corrected and which were manufactured under essentially the same conditions, with essentially the same materials, processes, etc., and which are considered subject to the same failure. Acceptance and shipment of the product shall be discontinued until corrective action acceptable to the qualifying activity has been taken. After the corrective action has been taken, group B inspection shall be repeated on additional sample units (all inspections, or the inspection which the original sample failed, at the option of the qualifying activity). Group A inspection may be reinstituted; however, final acceptance and shipment shall be withheld until the group B inspection has shown that the corrective action was successful. In the event of failure after reinspection, information concerning the failure shall be furnished to the cognizant inspection activity and the qualifying activity.

4.5.3 Inspection of packaging. The sampling and inspection of the preservation, packing, and container marking shall be in accordance with the requirements of MIL-M-55565.

4.6 Methods of inspection.

4.6.1 Materials. The manufacturers shall certify in writing that the materials used meet all the requirements of 3.4.

4.6.2 Dimensions. All dimensions shall be measured with a suitable instrument, (see 4.1.2) to the requirements of 3.5.1.

4.6.3 Visual inspection. Level A delay lines shall be visually inspected with normal or corrected 20/20 vision to meet the requirements of 3.5.2. Level B delay lines shall be inspected in accordance with method 2009 of MIL-STD-883.

4.6.4 Solderability (see 3.6). Level A delay lines shall be tested in accordance with method 208 of MIL-STD-202. The following details shall apply:

- a. Special preparation of specimen: Sample units shall not have been soldered during any of the previous tests.
- b. Number of terminations of each part to be tested: All level B delay lines shall be tested in accordance with method 2003 (solder temperature $+245^{\circ}\text{C} \pm 5^{\circ}\text{C}$) of MIL-STD-883.

4.6.5 Resistance to solvents (see 3.7). Level A delay lines shall be tested in accordance with method 215 of MIL-STD-202. Level B delay lines shall be tested in accordance with method 2015 of MIL-STD-883.

4.6.6 Resistance to soldering heat (see 3.8). Delay lines shall be tested in accordance with method 210 of MIL-STD-202. The following details shall apply:

- a. Special preparation of specimen: None.
- b. Mounting board shall not be metal clad.
- c. Test condition: D.
- d. Cooling time: Five minutes.

e. Examinations after test:

- (1) Level A: Electrical characteristics and X-rays in two perpendicular planes (the two largest surface areas).
- (2) Level B: Electrical characteristics, X-rays in two perpendicular planes (the two largest surface areas), and requirements of method 2014 of MIL-STD-883.

4.6.7 Terminal strength (see 3.9). Level A delay lines shall be tested as specified in accordance with MIL-STD-202, method 211, test condition A, applied force 5 pounds. One terminal on each test sample shall be subjected to the test. Level B delay lines shall be tested in accordance with method 2004, condition B-2, of MIL-STD-883.

4.6.8 Seal (see 3.10).

4.6.8.1 Level A. Delay lines shall be immersed for a minimum of 2 minutes in a bath of water, or any other suitable liquid of no greater density and surface tension, maintained at a temperature of at least +85°C. The temperature of the delay line shall not exceed +40°C at the time of immersion.

4.6.8.2 Levels B and S. Levels B and S delay lines shall be tested in accordance with method 1014 of MIL-STD-883.

4.6.9 Electrical characteristics (see 3.11).

4.6.9.1 Pulse methods. Any pulse method may be used; however, the reference method (see 4.3.1) shall be used in case of conflict.

4.6.9.1.1 Delay time. The time delay of pulses taken at each tap and the output of delay lines shall be measured to determine conformance with 3.11.1.

4.6.9.1.2 Rise time. The rise time of pulses taken at the output shall be measured to determine conformance with 3.11.2.

4.6.9.1.3 Delay time at temperature extremes (see 3.11.3). The output of the delay line shall be measured at the maximum and minimum operating temperatures. Power shall be applied after temperature stabilizes.

4.6.9.1.4 DC characteristics (see 3.11.4). DC characteristics shall be checked with suitable measuring equipment. The parameters shall fall within the limitations on individual specification sheets.

4.6.10 Salt spray (corrosion) (see 3.12). When specified, level A delay lines shall be tested in accordance with method 101 of MIL-STD-202, test condition A. Level B delay lines shall be tested in accordance with method 1009, condition A of MIL-STD-883.

4.6.11 Vibration (see 3.13). Level A delay lines shall be tested in accordance with method 214 of MIL-STD-202. Levels B and S delay lines shall be tested in accordance with method 2007, condition A, of MIL-STD-883.

- a. Method of mounting: Delay lines shall be mounted by soldering to a printed wiring board.
- b. One test point.
- c. Test conditions I and K: Fifteen minutes.
- d. Measurements before and after: Delay time.
- e. There shall be no electrical discontinuity during the test.

4.6.12 Shock (see 3.14). Level A delay lines shall be tested in accordance with method 213 of MIL-STD-202, test condition I. Level B delay lines shall be tested in accordance with method 2002, condition C of MIL-STD-883.

4.6.13 Flammability (see 3.15). Level A delay lines shall be tested in accordance with method 111 of MIL-STD-202. The following details and exception shall apply:

- a. Point of flame application: The flame shall be applied to the body.
- b. Allowable time for burning of visible flame on specimen: Three minutes maximum.
- c. Inspection during and after test: Delay lines shall be inspected for evidence of violent burning which results in an explosive-type fire, dripping of flaming material, and visible burning which continues beyond the allowable duration after removal of the applied flame. Level B delay lines do not require this test.

4.6.14 Thermal shock (see 3.16). Level A delay lines shall be tested in accordance with method 107 of MIL-STD-202. The following details shall apply:

- a. Test condition B-2 (50 cycles) for qualification and group B (except low temperature shall be -55°C).
- b. Test condition B (except 15 cycles) for group A (except low temperature shall be -55°C).
- c. Measurements before and after test: Delay time. Level B delay lines shall be tested in accordance with method 1010, condition C (50 cycles) of MIL-STD-883.

4.6.15 Moisture resistance (see 3.17). Level A delay lines, unless otherwise specified (see 3.1), shall be tested in accordance with method 106 of MIL-STD-202, except step 7b, which is not applicable. Load voltage not applicable; measurements taken before and after delay times. Level B delay lines shall be tested in accordance with method 1004 of MIL-STD-883.

4.6.16 Life (see 3.18). Level A delay lines shall be tested in accordance with method 108 of MIL-STD-202. The following details shall apply:

- a. Distance of temperature measurements from specimens: Three inches, in still air.
- b. Test temperature and tolerance: $+125^{\circ}\text{C} \pm 3^{\circ}\text{C}$ ($+257^{\circ}\text{F} \pm 5^{\circ}\text{F}$).
- c. Operating conditions: 3.0 volts, square wave, 50 percent duty cycle, $V_{\text{CC}} = 5.5 \pm 0.1$ volts, frequency 100 kHz, taps unloaded. Fixturing shall guarantee that supply voltage is maintained throughout life test. Level B delay lines shall be tested in accordance with method 1005 (1,000 hours at $+125^{\circ}\text{C}$) of MIL-STD-883.
- d. Test condition: D.
- e. Measurements: Delay time and DC characteristics. Level B delay lines shall be tested in accordance with method 1005 (1000 hours at $+125^{\circ}\text{C}$) of MIL-STD-883.

4.6.17 Fungus (see 3.19). Unless certification is provided, level A delay lines shall be tested in accordance with method 508 of MIL-STD-810. Level B delay lines do not require this test.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-M-55565.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. Delay lines covered by this specification are used in electronic equipment where a buffered pulse delay is required.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of the specification.
- b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1).

6.2.1 Delay lines not covered by specification sheets. See figure 3.

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in the applicable Qualified Products List, whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they proposed to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. The activity responsible for the Qualified Products List is the 2750 LOG/ES Gentile AF Station, Dayton, OH 45444-5400; however, information pertaining to qualification of products may be obtained from the Defense Electronics Supply Center (DESC-E), Dayton, OH 45444.

6.3.1 Provisions governing qualifications. Copies of SD-6, "Provisions Governing Qualification", may be obtained upon application to Standardization Documents Order Desk, Building 40, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

6.4 PIN. The PIN should be structured in accordance with 1.2.1.

6.5 Subject term (key word) listing.

Buffered pulse delay
 Delay time
 Duty cycle
 Fanout
 Hybrid microcircuit
 Number of sections
 Pulse width
 Rise/Fall time
 Taps

6.6 New specification sheets. A new specification sheet may be written by supplying the following:

- a. A proposed specification sheet (see an existing specification sheet).
- b. The difference(s) between the proposal and the most similar existing specification sheet.
- c. A list of military contracts or systems the proposed specification sheet part(s) have been used in.

This information shall be forwarded to both 2750 LOG/ES, Gentile AF Station, Dayton, OH 45444-5400 and Defense Electronics Supply Center, ATTN: DESC-EMM, Dayton, OH 45444-5283.

6.7 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

MIL-D-83532A

NONSTANDARD DELAY LINE,
ACTIVE, DRAWING EVALUATION CHECKLIST

Log no. _____			
Drawing no. (CAGE) _____ ()	Adequate	Inadequate (see notes)	Missing
Vendor PIN (CAGE) _____ ()			
Delay lines acquired to this drawing meet all the requirements of MIL-D-83532 and as specified herein. In case of conflict, this drawing takes precedence.			
Vendor PIN on drawing			
Vendor CAGE on drawing			
Dimensions			
Tolerances on dimensions			
Schematic (circuit diagram)			
Terminals (type designation in accordance with MIL-STD-1276)			
Weight			
Item marking (index mark identification minimum)			
Operating temperature range (minimum and maximum)			
Delay time total			
Delay time taps			
Rise time			

FIGURE 3. Drawing evaluation checklist.

NONSTANDARD DELAY LINE,
ACTIVE, DRAWING EVALUATION CHECKLIST - Continued

Log no. _____ Drawing no. (CAGE) _____ () Vendor PIN (CAGE) _____ ()	Adequate	Inadequate (see notes)	Missing
Logic 1 output voltage			
Logic 0 output voltage			
Logic 1 output current			
Logic 0 output current			
Fanout per unit			
Fanout per tap			
Delay time variation with temperature			
Quality assurance provisions			
To be in accordance with DOD-STD-100, this drawing is correctly designated:			
Should be designated as: Specification control drawing Source control drawing Selected item drawing Altered item drawing			
Inspection of industrial packaging			
Levels of preservation and packing required			
Special or other identification if required			

FIGURE 3. Drawing evaluation checklist - Continued.

APPENDIX

CASE OUTLINES

10. SCOPE

10.1 Scope. This appendix describes the six case outlines available for delay lines contained in MIL-D-83532. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance only.

20. APPLICABLE DOCUMENTS. This section is not applicable to this appendix.

30. GENERAL REQUIREMENTS. See figure 4.

APPENDIX

Case style A

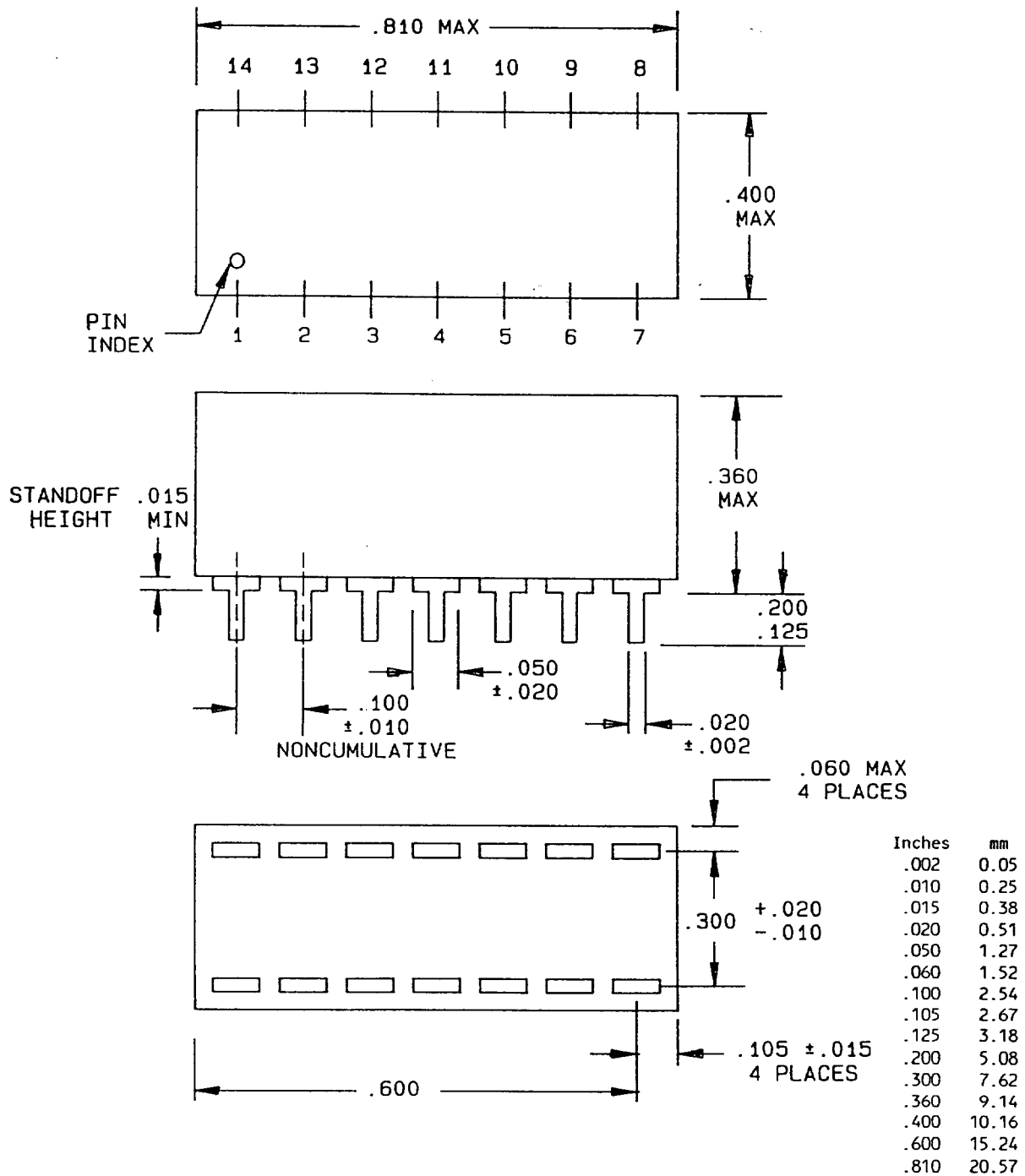


FIGURE 4. Case style.

APPENDIX

Case style B

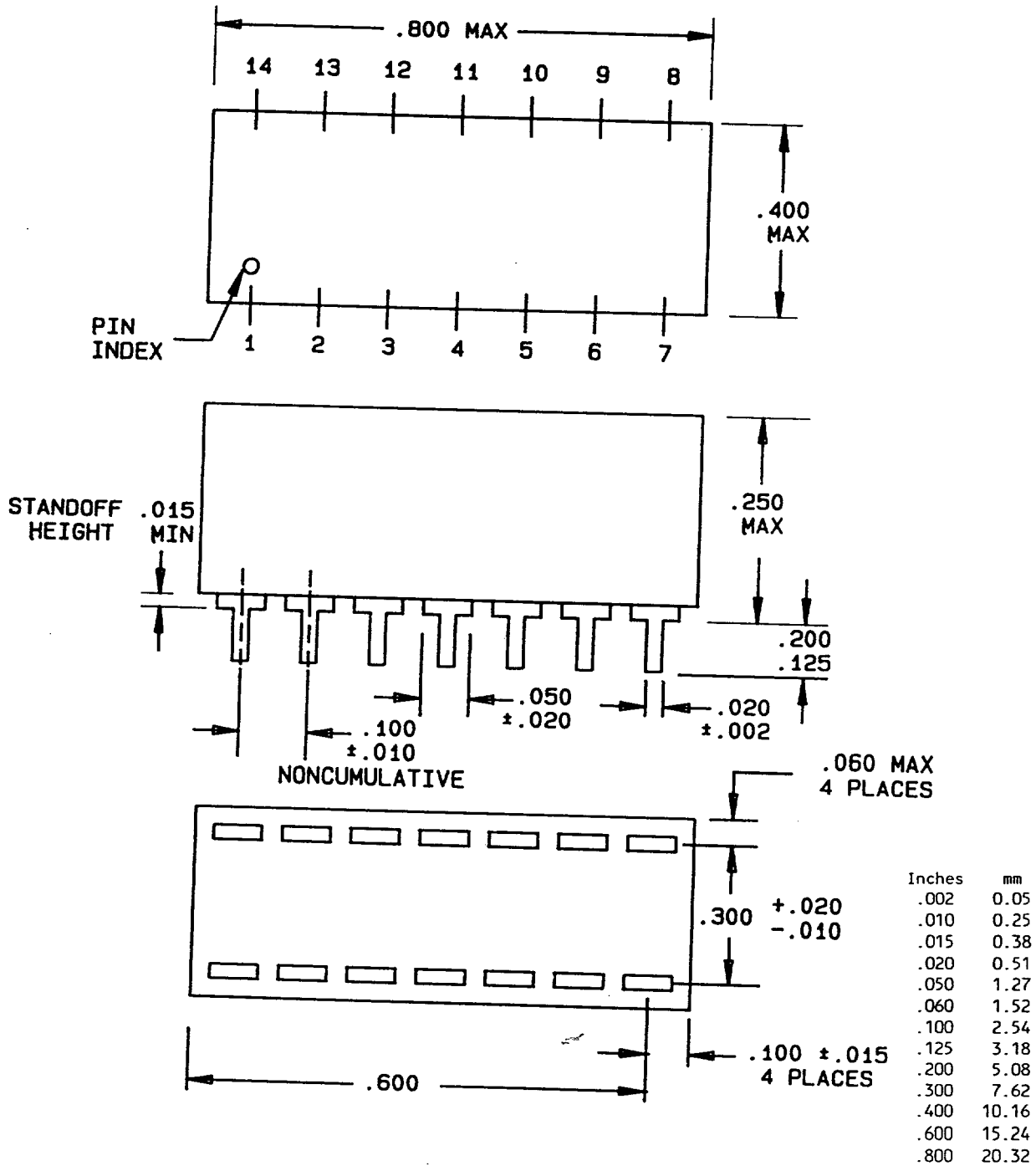


FIGURE 4. Case style - Continued.

APPENDIX

Case style C

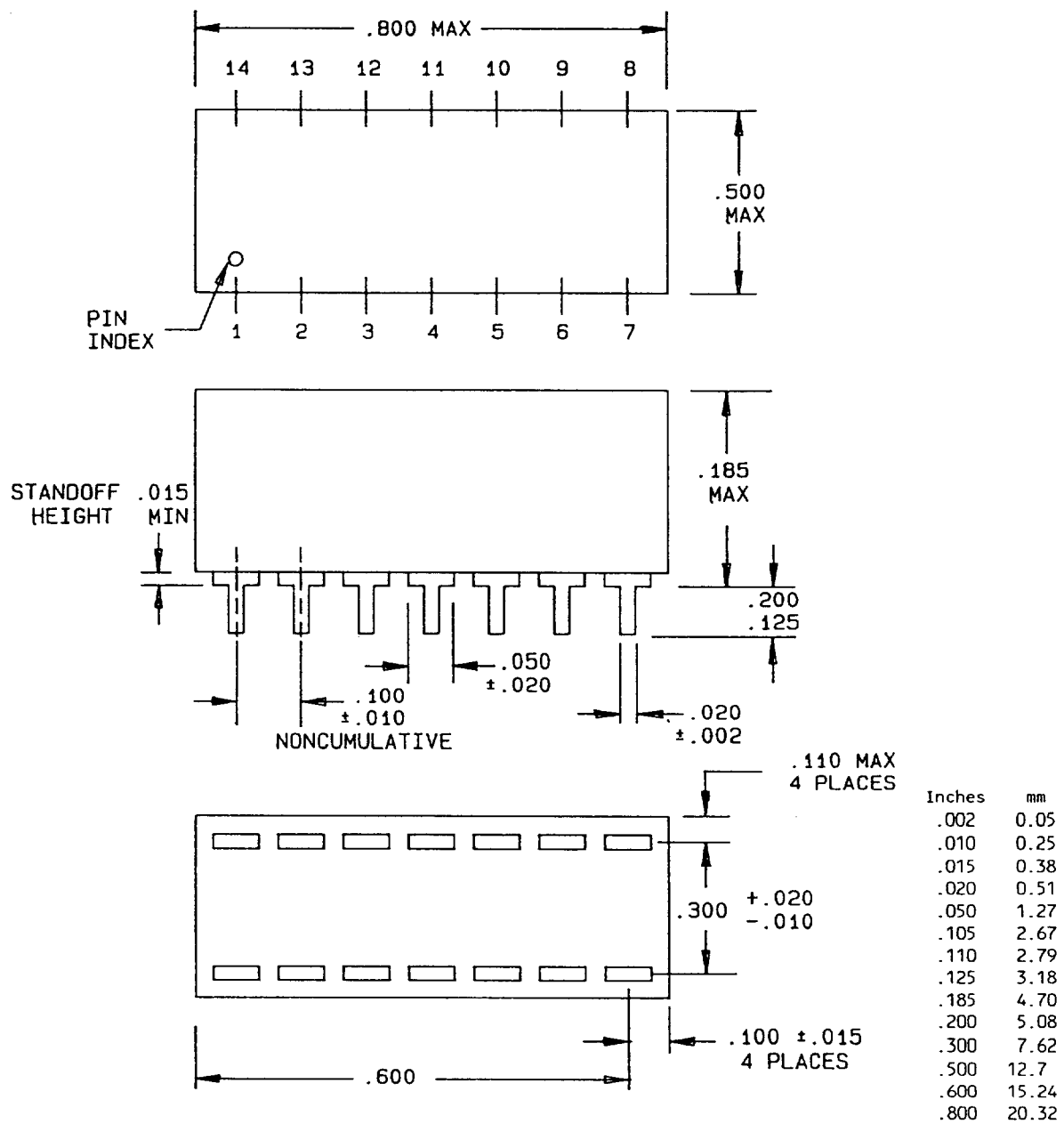


FIGURE 4. Case style - Continued.

APPENDIX

Case style D

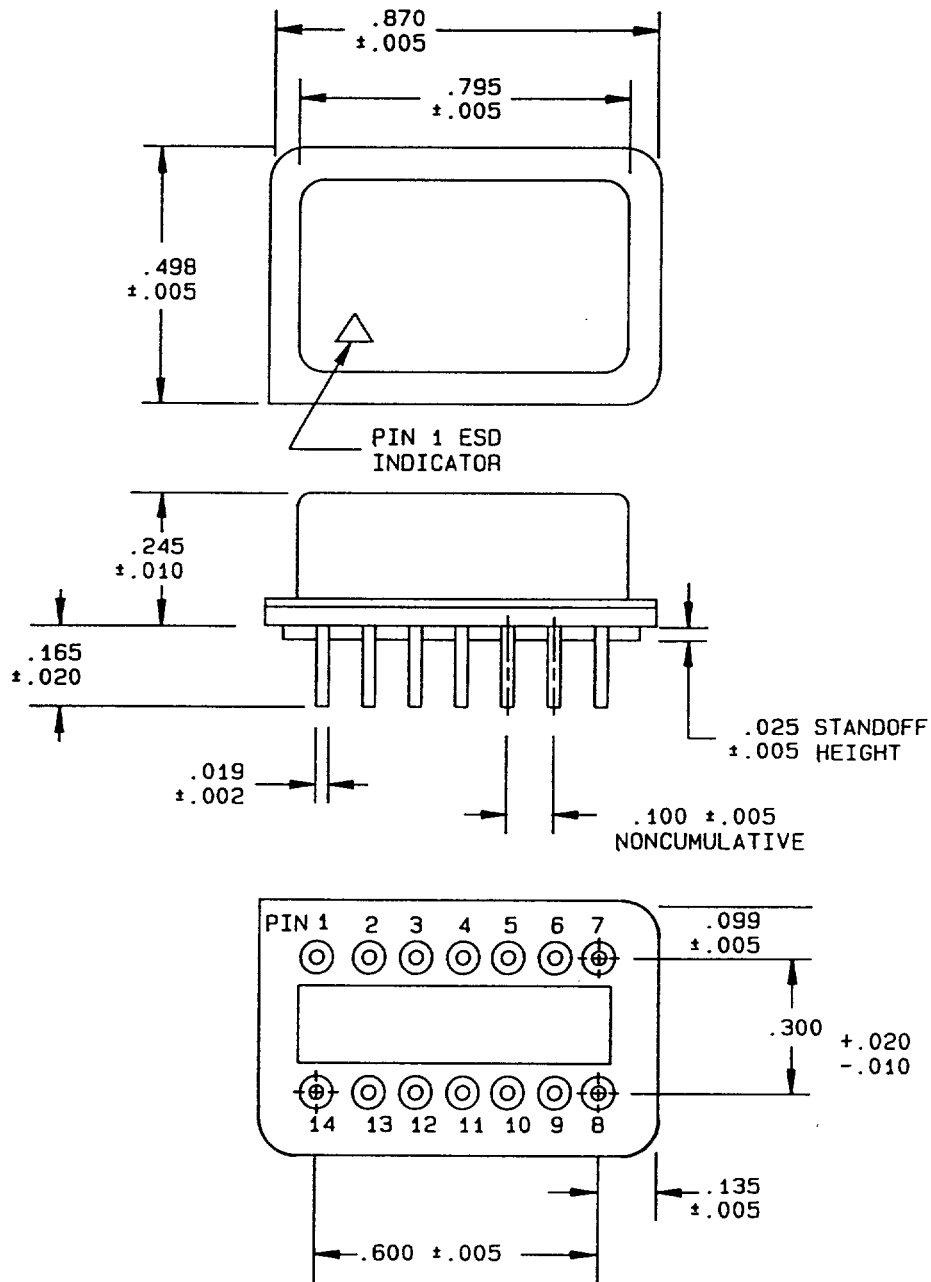
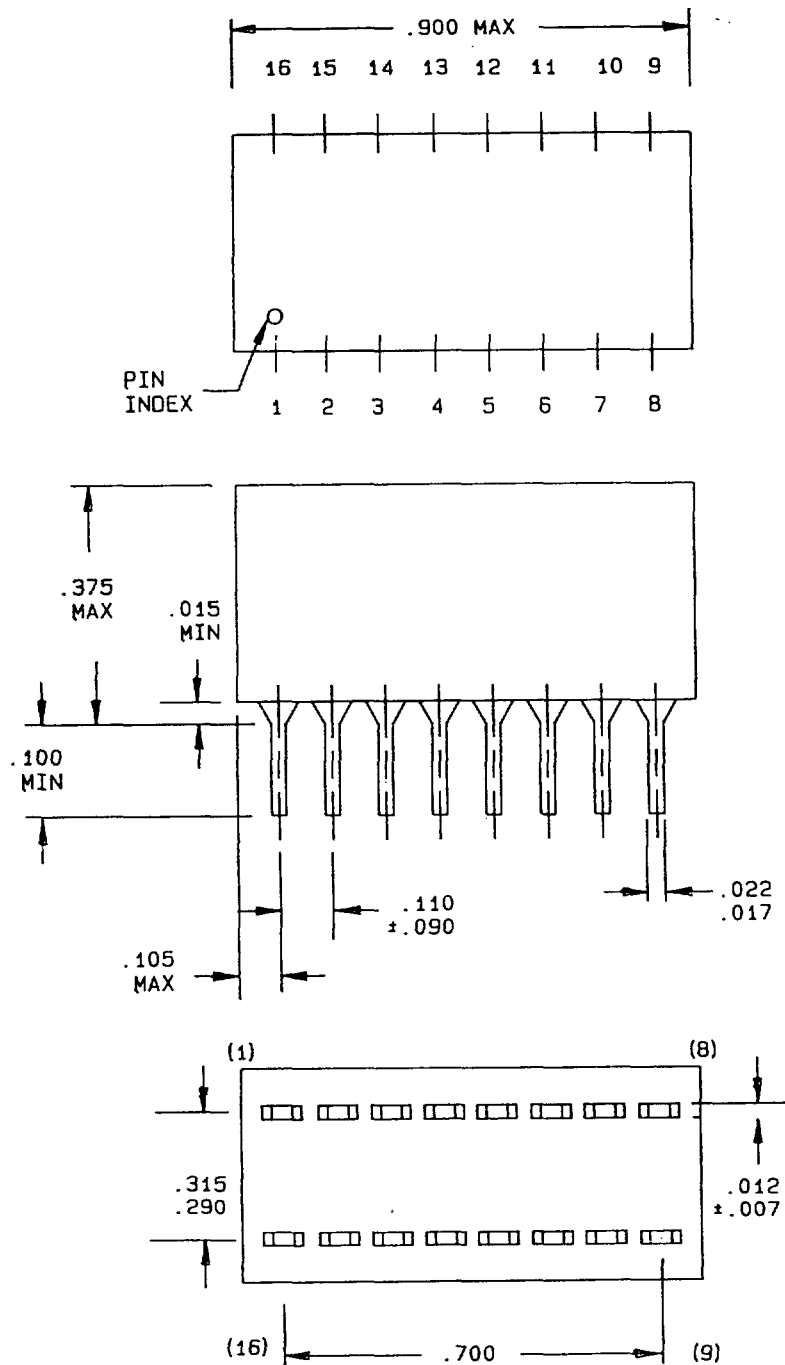


FIGURE 4. Case style - Continued.

APPENDIX

Case style E

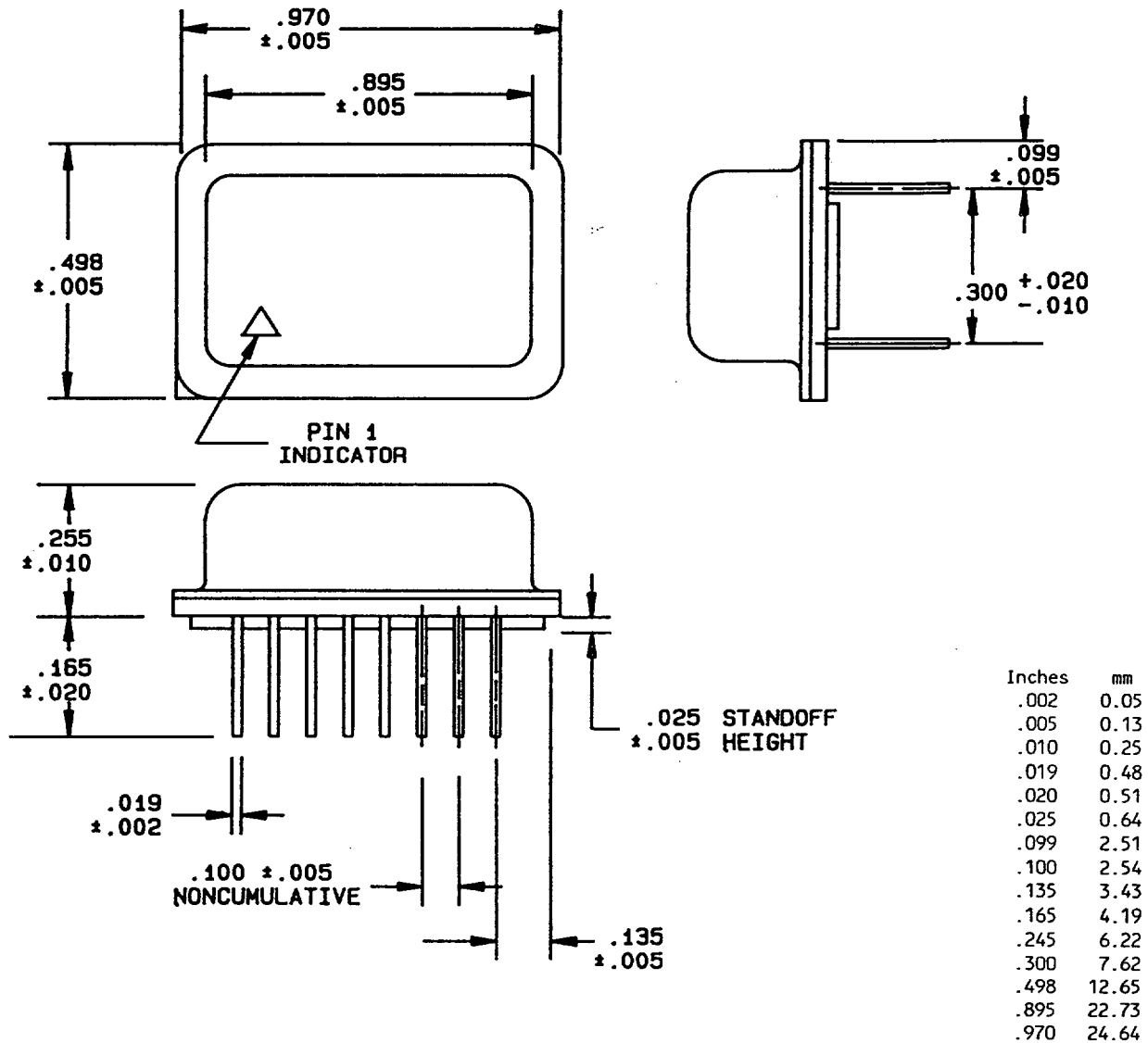


Inches	mm
.007	0.18
.012	0.30
.015	0.38
.017	0.43
.022	0.56
.060	1.52
.090	2.29
.100	2.54
.105	2.67
.115	2.92
.290	7.37
.315	8.00
.375	9.53
.400	10.16
.900	22.86

FIGURE 4. Case style - Continued.

APPENDIX

Case style F.



NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is $\pm .005$ (0.13 mm).
4. Location and shape of standoffs are optional. Height shall be as indicated.
5. Case material is epoxy for case styles A, B, C, and E.
6. Case material is metal for case styles D and F.

FIGURE 4. Case style - Continued.

MIL-D-83532A

CONCLUDING MATERIAL

Custodians:

Army - ER
Navy - EC
Air Force - 85

Review activities:

Air Force - 11, 19, 99
DLA - ES

User activities:

Navy - AS, CG, MC, SH

Preparing activity:
Air Force - 85

Agent:
DLA - ES

(Project 5999-0284)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER

MIL-D-83532A

2. DOCUMENT DATE (YYMMDD)

3. DOCUMENT TITLE

Military Specification, Delay Lines, Active, General Specification for

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)

b. ORGANIZATION

c. ADDRESS (Include Zip Code)

d. TELEPHONE (Include Area Code)

(1) Commercial

(2) AUTOVON

(If applicable)

7. DATE SUBMITTED
(YYMMDD)

8. PREPARING ACTIVITY

a. NAME

b. TELEPHONE (Include Area Code)

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(2) AUTOVON

c. ADDRESS (Include Zip Code)

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